

CONVEYING DEVICE

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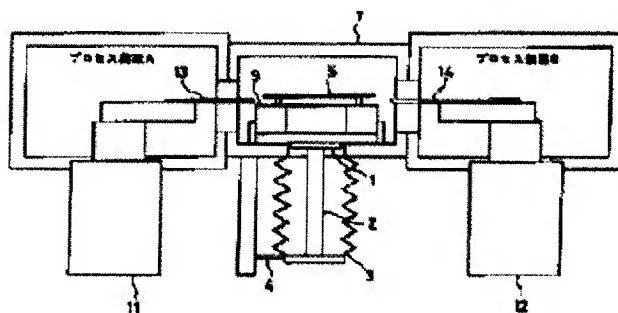
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Abstract of JP7108159

PURPOSE: To provide a tunnel conveying device capable of smoothly transferring an object to be transported such as a wafer in a boundary region between a process device and the tunnel conveying device.

CONSTITUTION: In this device provided with a carrying truck 9 mounting the object to be transported in a tunnel 7 and carrying the object to be transported in such the state that the outdoor air is cut off with a tunnel partition, a mounting table 1 mounting the object to be transported 5 is placed in the tunnel 7 and the mounting table 1 is moved vertically while cutting off the outdoor air from the inside of the tunnel 7 as it is, and passage of the carrying truck 9 is not hindered by the movement of the mounting table 1.



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CLAIMS

[Claim(s)]

[Claim 1]In a tunnel conveying machine which conveys carried one where it had a carrying truck which carries carried one in an inside of a tunnel and the open air is intercepted by a tunnel septum, A conveying machine characterized by moving a table which lays said carried one in an inside of said tunnel, and this table to a sliding direction with the state where said inside of a tunnel intercepted the open air, and keeping movement of this table from passing of said carrying truck being barred.

[Claim 2]The tunnel conveying machine according to claim 1 which equips said carrying truck with an opening penetrated to a sliding direction, and is characterized by said table being movable to a sliding direction in inside of this opening.

[Claim 3]Inside of an opening which height of a conveyance face of a robot to which carried one which has been arranged at both sides of said tunnel conveying machine is transported differs, and is penetrated to a sliding direction of said carrying truck by a means to make said table go up and down. The tunnel conveying machine according to claim 2 provided with a means to transport carried one between robots with which height of said conveyance face differs.

[Claim 4]The tunnel conveying machine according to claim 1 to 3, wherein the hermetic seal of said table is carried out to an opening of the undersurface of said tunnel septum, or the upper surface by bellows mechanism and an elevator mechanism and it is supported by sliding direction movable.

[Claim 5]The tunnel conveying machine according to claim 1 to 4, wherein said tunnel conveying machine is a linear motor type track.

[Claim 6]The tunnel conveying machine according to claim 5, wherein said linear motor type track is a thing which makes it run said carrying truck in the state where it was made to rise to surface from the tunnel outside with magnetic attraction power of an electromagnet for surfacing which equipped said carrying truck with a target of a magnetic material, and with which said tunnel exterior was equipped.

[Claim 7]The tunnel conveying machine according to claim 6, wherein said linear motor type track is can-ized and it succeeds in magnetic levitation control and travel stop control of said carrying truck from said tunnel outside through this can.

[Claim 8]The tunnel conveying machine according to claim 1 to 7, wherein atmosphere inside said tunnel is a vacuum and atmosphere of the tunnel exterior is the atmosphere.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to a conveying machine, especially is provided with the suitable carrying truck for manufacture of a semiconductor, etc. which carries carried one in the inside of a tunnel, and relates to the tunnel conveying machine which conveys carried one where the open air is intercepted by a tunnel septum.

[0002]

[Description of the Prior Art]The necessity of conveying between process units, for example under a vacuum atmosphere has come out without putting processed materials, such as a wafer, to the open air, in order to require very advanced cleanliness about semiconductor manufacture etc. and to prevent particle contamination these days, or in order to prevent molecular contamination, such as oxidation. Two or more process units are tied with a vacuum tunnel conveying machine as the one method, and the trial which carries a wafer in a carrying truck and conveys the inside of a vacuum tunnel occurs. Drawing 12 shows the example of the semiconductor production line which combined two or more process units with the tunnel conveying machine.

[0003]Drawing 13 is the sectional view which met AA line shown in drawing 12. Process unit A and B use the both sides of the conveyance tunnel 7 for relativity, and it is arranged. Process unit A and B have the transfer robots 11 and 12 in the robot chamber 25, respectively, Transport the wafer 5 to the process chamber 26 of process unit A and B from the carrying truck 9 which runs in the tunnel conveying machine 7, or, Conversely, the wafer which carried out the end of processing by process unit A and B is taken out from process unit A and B, and is transported to the carrying truck 9, the carrying truck 9 runs in the tunnel carrying path 7, and it conveys to the following processing unit.

[0004]With a linear motor, a stop position arrangement device, etc. which were attached to the tunnel septum 8 exterior and which are not illustrated, this carrying truck 9 moves in the inside of the tunnel 7, conveys carried one 5, and stops to a position.

[0005>About a tunnel conveying machine, without a carrying truck contacting a tunnel septum inside a tunnel, The linear motor type track which can make it run a carrying truck is developed, and carried one, such as a wafer, can be conveyed between processing units under very pure environment, without generating particles inside a tunnel according to the conveying machine to apply. An example of the linear motor type track to apply is indicated in detail by this invention person etc. international patent application PCT/JP93/00930. The member in which this device has fear of the generation of gas, such as a magnetic pole sensor and an electromagnet, is arranged at the atmosphere side of a tunnel septum, The carrying truck in the inside of the open air and the intercepted tunnel is surfaced via a thin septum, and a carrying truck is run a carrying truck or stopped with the linear motor etc. which have been similarly arranged to the tunnel septum exterior. According to the linear motor type track to apply, it is also possible for a carrying truck to branch to direction crossing at a right angle, and to run in the tunnel which has branching which intersected perpendicularly.

[0006]

[Problem(s) to be Solved by the Invention]However, in the border area of such a process unit and a tunnel conveying machine, In the transfer between the process units which carry out for relativity of transporting the wafer 5 to process unit B from process unit A, Operation that once place the wafer 5 on the carrying truck 9, then the robot 12 of process unit B takes up the wafer 5 on the carrying truck 9, and the robot 11 of process unit A transports it into process unit B is performed. That is, between process unit A which carried out for relativity, and B, when delivering the wafer 5, in spite of not conveying the wafer 5, the carrying truck 9 must be used as a temporary table which delivers the wafer 5, and must be located between process unit A and B. When the carrying truck 9 was moving to other positions in the tunnel 7 by chance, the wafer 5 could not be delivered, a transfer of a wafer was not completed at time until the carrying truck 9 returns between process unit A and B, but there was a problem of taking the time for delivering a wafer.

[0007]Delivering the wafer 5 directly by the robots 11 and 12 between process unit A and B, as shown in drawing 14 is also considered. However, as shown in drawing 15 in such a case, the shape of the fingers 13 and 14 of a robot must be the shape in which it does not interfere mutually. However, the shape of the robot fingers 13 and 14 is already determined by the shape of the wafer table in a process unit, etc., change is rather difficult and it is not easy to make it not interfere between the robot fingers 13 and 14. For this reason, it cannot usually use transporting the wafer 5 directly by the fingers 13 and 14 of the robots 11 and 12 among the processing units A and B.

[0008]There is height of the wafer conveyance face of process unit A connected with process unit A and B as a problem of the border area between the conveyance tunnels 7 and B. The wafer conveyance faces of the common process unit differ for every device, and have various height. If it is going to connect these to a common tunnel conveying machine, for some transfer robots 11 and 12, the range of the up-and-down motion is restricted, and it may be difficult to deliver and receive a wafer from a carrying truck.

[0009]The wafer table inside a device moves up and down by process unit A and some B, and the robot 11 and 12 the very thing have some which cannot move up and down. In such a case, as shown in drawing 16, the middle robot chamber 27 is inserted between process unit A, B, and a conveyance tunnel, and wafer conveyance face height is adjusted by delivering and receiving a wafer via the robot 28 in this chamber 27. For this reason, the conveying machine of a wafer is enlarged and there is a problem of becoming expensive.

[0010]In view of the problem of the starting conventional technology, it succeeds in this invention, and it is a thing.

It is providing the tunnel conveying machine which can transport carried one, such as a wafer, smoothly in the border area of the purpose and a tunnel conveying machine.

[0011]

[Means for Solving the Problem]In a tunnel conveying machine which conveys carried one where a tunnel conveying machine of this invention was provided with a carrying truck which carries carried one in an inside of a tunnel and the open air is intercepted by a tunnel septum, A table which lays said carried one in an inside of said tunnel, and this table are moved to a sliding direction with the state where said inside of a tunnel intercepted the open air, and movement of this table was kept from passing of said carrying truck being barred.

[0012]

[Function]The table which lays carried one in the carrying truck stop position in the tunnel between process unit A and B, Since it had a means to move this table to a sliding direction after the inside of a tunnel has intercepted the open air, delivery of a wafer is attained between the robots of the process unit which faces to a tunnel via the table of a wafer. A table pushes up the wafer laid on the carrying truck when a carrying truck was also equipped with the opening penetrated to a sliding direction and the carrying truck had stopped according to an elevator mechanism from the bottom, Let the wafer on the table which went up in arbitrary positions be the structure where the robot finger of a process unit goes for a receipt. Restriction of a transfer robot's height is lost and Therefore, various kinds of wafer conveyance height, Without

using a middle transfer robot, also when a transfer robot cannot move the finger up and down, a process unit can be connected to a common conveyance tunnel, and a wafer can be delivered smoothly.

[0013]

[Example]Below, the 1st thru/or the 3rd example of this invention is described in detail, referring to an accompanying drawing. Drawing 1 thru/or drawing 2 show the tunnel conveying machine of the 1st example of this invention, drawing 1 shows arrangement with a process unit and a tunnel conveying machine, and drawing 2 shows the section composition between the tunnel conveying machine and process unit which met AA line in drawing 1. As shown in drawing 1, the opening 6 is formed in the conveyance tunnel septum 8 lower part at the halting point of the carrying truck 9 between the places to which a wafer may be transported via the conveyance tunnel 7, i.e., a process unit, and the table 1 which lays the wafer 5 in this opening 6 is arranged. Since the base material 2 is connected to the elevator 4, the table 1 is movable to a sliding direction. Since the bellows 3 expands and contracts with movement of the sliding direction of the table 1, the state where conveyance tunnel 7 inside was intercepted with the open air is held.

[0014]The table 1 of the wafer 5 has usually fallen in the opening 6 of the tunnel septum 8. When delivering the wafer 5 to process unit B from process unit A, the table 1 in which the wafer 5 is laid goes up in predetermined height, and the robot 11 of process unit A lays the wafer 5 on the table 1 by the finger 13 first. Then, the finger 14 of the robot 12 of process unit B takes up the wafer 5 from the table 1, and transports it into process unit B. When the elevator 4 moves caudad in the postposing stand 1, the table 1 falls in the opening 6 of the tunnel septum 8.

[0015]By drawing the finger 13 of the robot 11 in process unit A, and drawing the finger 14 of the robot 12 in process unit B, When it will be in the state where anything does not have a projection and a carrying truck stops or passes into this portion, since the wafer table 1 has fallen in the tunnel septum 8 lower part, the inside of the conveyance tunnel 7 does not produce the problem of barring passing of the carrying truck 9. when the carrying truck 9 stops in the position between process unit A and B, as shown in the Prior art, the carrying truck 9 or its wafer 5 conversely carried in the carrying truck 9 can be transported for the wafer 5 to the processing units A and B from process unit A or B.

[0016]Drawing 4 is a perspective view showing the structure of the carrying truck of the 1st example. The carrying truck 9 is equipped with the opening 10 penetrated to a sliding direction, and the table 1 which does not illustrate the inside of this opening 10 is movable to a sliding direction. The wafer 5 is supported by the pin 21 formed in the upper surface of the carrying truck 9, and is laid on the carrying truck 9. Although it is for the wheel 22 running a transportation direction the carrying truck 9, the magnetic devitation system conveying machine make carry out magnetic levitation of the carrying truck 9, and it is made to run by contact-ed from the septum 8 may be used, and the wheel 22 becomes unnecessary in this case. It is made for a linear motor type track to run in the state where it was made to rise to surface from the tunnel outside with the magnetic attraction power of the electromagnet for surfacing which equipped the carrying truck with the target of the magnetic material and with which the tunnel septum (can) exterior was equipped.

[0017]Drawing 5 thru/or drawing 7 show the conveyance tunnel in the tunnel conveying machine of the 2nd example of this invention, and the border area between process unit A and B. In this example, process unit A and process unit B differ so that the height of the conveyance face of a wafer may illustrate. Vertical movement shall be impossible for the robot 12 of process unit B, and the finger 14 of the robot 12 shall not fall to the wafer height on the carrying truck 9. Also in this example, like the 1st above-mentioned example, the table 1 can carry out vertical movement, where the open air is intercepted with the elevator 4 and the bellows 3. In the carrying truck 9, it has the opening 10 of the shape which can pass through the table 1 into the portion corresponding to the undersurface of the wafer 5 placed on the carrying truck as shown in drawing 4.

[0018]Next, operation of this example is explained. In the state of the beginning, the table 1 has fallen downward and is located in the opening 6 of the tunnel septum 8. In order for the carrying truck 9 to carry the wafer 5 and to transport the wafer 5 to process unit B in this state, it stops

to a predetermined stop position. As shown in drawing 5, the table 1 goes up from the opening 6 of the tunnel septum 8, and the wafer 5 is lifted through the inside of the opening 10 of the carrying truck 9 to the position shown in drawing 6. Next, as shown in drawing 6, the finger 14 of the robot 12 of process unit B extends, and it enters under the wafer 5. Next, as shown in drawing 6, lower the table 1, the finger 14 of the robot 12 is made to support the wafer 5, and the robot 12 of process unit B transports the wafer 5 into process unit B. The table 1 falls to the opening 6 of the septum 8, and the transportation vehicle 9 runs in the tunnel 7 to the next stop predetermined position.

[0019]The shape of the carrying truck 9 can consider various things as shown in drawing 8 thru/or drawing 9 other than the 1st example shown in drawing 4. In the carrying truck 9 of the 2nd example shown in drawing 8, it has the top plate 23 on the table 1 in which the wafer 5 is laid. Thereby, adhesion of the dust to the surface of the wafer 5 which is carried one, etc. is prevented.

[0020]Drawing 9 shows the shape of the carrying truck of the 3rd example. When the table 1 is carrying out the opening to the transportation direction like this example, In the carrying truck 9, the table 1 can run to the next destination in the stage which lifted the wafer 5 from the carrying truck 9, and it becomes possible for it to become unnecessary to stop to a spot place, and to raise the speed of a transfer of a wafer until the process of transfer of the wafer 5 is completed.

[0021]Drawing 10 thru/or drawing 11 show the border area between process unit A in the tunnel conveying machine of the 3rd example of this invention, and B. In this example, it has the opening 26 on the upper surface of the tunnel septum 8, and the table 1 is movable to a sliding direction via this opening 26. The structure where the table 1 is connected to the elevator 4 by the base material 2, the elevator 4 moves the table 1 to a sliding direction, and the open air is intercepted by the bellows 3 is the same as that of the 1st and 2nd above-mentioned example. Drawing 11 is a perspective view showing the shape of the table 1 which can be put on this example. The pin 21 which supports the wafer 5 is arranged in the table 1. The finger 13 of the robot 11 conveys the wafer 5 from the transverse direction of the table 1, and lays it on the pin 21.

[0022]The table 1 is used for transporting the wafer 5 to between process unit A and the process unit B chiefly in this example. The wafer 5 can be delivered to the table 1 by laying the wafer 5 in the finger 13 from process unit A, and lengthening the finger 13 of the robot 11 as an example of operation. The wafer 5 laid in the table 1 is inserted in the finger 14 of the robot 12 of process unit B by the wafer undersurface, and the wafer 5 is received and passed in process unit B by receiving the wafer 1 and pulling back the finger 14 in the process B.

[0023]The atmosphere in a conveyance tunnel is advanced clean atmospheres, such as a vacuum. The meaning of this invention is not limited to the above-mentioned example, and it is not necessary to say that various modification is possible. The numerals same in the inside of each figure show a same or considerable portion.

[0024]

[Effect of the Invention]It can carry out without using a carrying truck by going conveyance of a wafer via a table between the process units arranged on both sides of a tunnel conveying machine the 1st according to the conveying machine of this invention, as explained above. Even when the conveyance height of the wafer between process units differs in the 2nd, the table can adjust the height of a conveyance face easily from having the up-and-down moving mechanism. It enables this to transport carried one smoothly between process units.

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TECHNICAL FIELD

[Industrial Application]This invention relates to a conveying machine, especially is provided with the suitable carrying truck for manufacture of a semiconductor, etc. which carries carried one in the inside of a tunnel, and relates to the tunnel conveying machine which conveys carried one where the open air is intercepted by a tunnel septum.

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PRIOR ART

[Description of the Prior Art]The necessity of conveying between process units, for example under a vacuum atmosphere has come out without putting processed materials, such as a wafer, to the open air, in order to require very advanced cleanliness about semiconductor manufacture etc. and to prevent particle contamination these days, or in order to prevent molecular contamination, such as oxidation. Two or more process units are tied with a vacuum tunnel conveying machine as the one method, and the trial which carries a wafer in a carrying truck and conveys the inside of a vacuum tunnel occurs. Drawing 12 shows the example of the semiconductor production line which combined two or more process units with the tunnel conveying machine.

[0003]Drawing 13 is the sectional view which met AA line shown in drawing 12. Process unit A and B use the both sides of the conveyance tunnel 7 for relativity, and it is arranged. Process unit A and B have the transfer robots 11 and 12 in the robot chamber 25, respectively, Transport the wafer 5 to the process chamber 26 of process unit A and B from the carrying truck 9 which runs in the tunnel conveying machine 7, or, Conversely, the wafer which carried out the end of processing by process unit A and B is taken out from process unit A and B, and is transported to the carrying truck 9, the carrying truck 9 runs in the tunnel carrying path 7, and it conveys to the following processing unit.

[0004]With a linear motor, a stop position arrangement device, etc. which were attached to the tunnel septum 8 exterior and which are not illustrated, this carrying truck 9 moves in the inside of the tunnel 7, conveys carried one 5, and stops to a position.

[0005>About a tunnel conveying machine, without a carrying truck contacting a tunnel septum inside a tunnel, The linear motor type track which can make it run a carrying truck is developed, and carried one, such as a wafer, can be conveyed between processing units under very pure environment, without generating particles inside a tunnel according to the conveying machine to apply. An example of the linear motor type track to apply is indicated in detail by this invention person etc. international patent application PCT/JP93/00930. The member in which this device has fear of the generation of gas, such as a magnetic pole sensor and an electromagnet, is arranged at the atmosphere side of a tunnel septum, The carrying truck in the inside of the open air and the intercepted tunnel is surfaced via a thin septum, and a carrying truck is run a carrying truck or stopped with the linear motor etc. which have been similarly arranged to the tunnel septum exterior. According to the linear motor type track to apply, it is also possible for a carrying truck to branch to direction crossing at a right angle, and to run in the tunnel which has branching which intersected perpendicularly.

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EFFECT OF THE INVENTION

[Effect of the Invention]It can carry out without using a carrying truck by going conveyance of a wafer via a table between the process units arranged on both sides of a tunnel conveying machine the 1st according to the conveying machine of this invention, as explained above. Even when the conveyance height of the wafer between process units differs in the 2nd, the table can adjust the height of a conveyance face easily from having the up-and-down moving mechanism. It enables this to transport carried one smoothly between process units.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in the border area of such a process unit and a tunnel conveying machine, In the transfer between the process units which carry out for relativity of transporting the wafer 5 to process unit B from process unit A, Operation that once place the wafer 5 on the carrying truck 9, then the robot 12 of process unit B takes up the wafer 5 on the carrying truck 9, and the robot 11 of process unit A transports it into process unit B is performed. That is, between process unit A which carried out for relativity, and B, when delivering the wafer 5, in spite of not conveying the wafer 5, the carrying truck 9 must be used as a temporary table which delivers the wafer 5, and must be located between process unit A and B. When the carrying truck 9 was moving to other positions in the tunnel 7 by chance, the wafer 5 could not be delivered, a transfer of a wafer was not completed at time until the carrying truck 9 returns between process unit A and B, but there was a problem of taking the time for delivering a wafer.

[0007]Delivering the wafer 5 directly by the robots 11 and 12 between process unit A and B, as shown in drawing 14 is also considered. However, as shown in drawing 15 in such a case, the shape of the fingers 13 and 14 of a robot must be the shape in which it does not interfere mutually. However, the shape of the robot fingers 13 and 14 is already determined by the shape of the wafer table in a process unit, etc., change is rather difficult and it is not easy to make it not interfere between the robot fingers 13 and 14. For this reason, it cannot usually use transporting the wafer 5 directly by the fingers 13 and 14 of the robots 11 and 12 among the processing units A and B.

[0008]There is height of the wafer conveyance face of process unit A connected with process unit A and B as a problem of the border area between the conveyance tunnels 7 and B. The wafer conveyance faces of the common process unit differ for every device, and have various height. If it is going to connect these to a common tunnel conveying machine, for some transfer robots 11 and 12, the range of the up-and-down motion is restricted, and it may be difficult to deliver and receive a wafer from a carrying truck.

[0009]The wafer table inside a device moves up and down by process unit A and some B, and the robot 11 and 12 the very thing have some which cannot move up and down. In such a case, as shown in drawing 16, the middle robot chamber 27 is inserted between process unit A, B, and a conveyance tunnel, and wafer conveyance face height is adjusted by delivering and receiving a wafer via the robot 28 in this chamber 27. For this reason, the conveying machine of a wafer is enlarged and there is a problem of becoming expensive.

[0010]In view of the problem of the starting conventional technology, it succeeds in this invention, and it is a thing.

It is providing the tunnel conveying machine which can transport carried one, such as a wafer, smoothly in the border area of the purpose and a tunnel conveying machine.

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MEANS

[Means for Solving the Problem]In a tunnel conveying machine which conveys carried one where a tunnel conveying machine of this invention was provided with a carrying truck which carries carried one in an inside of a tunnel and the open air is intercepted by a tunnel septum, A table which lays said carried one in an inside of said tunnel, and this table are moved to a sliding direction with the state where said inside of a tunnel intercepted the open air, and movement of this table was kept from passing of said carrying truck being barred.

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OPERATION

[Function]The table which lays carried one in the carrying truck stop position in the tunnel between process unit A and B, Since it had a means to move this table to a sliding direction after the inside of a tunnel has intercepted the open air, delivery of a wafer is attained between the robots of the process unit which faces to a tunnel via the table of a wafer. A table pushes up the wafer laid on the carrying truck when a carrying truck was also equipped with the opening penetrated to a sliding direction and the carrying truck had stopped according to an elevator mechanism from the bottom, Let the wafer on the table which went up in arbitrary positions be the structure where the robot finger of a process unit goes for a receipt. Restriction of a transfer robot's height is lost and Therefore, various kinds of wafer conveyance height, Without using a middle transfer robot, also when a transfer robot cannot move the finger up and down, a process unit can be connected to a common conveyance tunnel, and a wafer can be delivered smoothly.

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EXAMPLE

[Example]Below, the 1st thru/or the 3rd example of this invention is described in detail, referring to an accompanying drawing. Drawing 1 thru/or drawing 2 show the tunnel conveying machine of the 1st example of this invention, drawing 1 shows arrangement with a process unit and a tunnel conveying machine, and drawing 2 shows the section composition between the tunnel conveying machine and process unit which met AA line in drawing 1. As shown in drawing 1, the opening 6 is formed in the conveyance tunnel septum 8 lower part at the halting point of the carrying truck 9 between the places to which a wafer may be transported via the conveyance tunnel 7, i.e., a process unit, and the table 1 which lays the wafer 5 in this opening 6 is arranged. Since the base material 2 is connected to the elevator 4, the table 1 is movable to a sliding direction. Since the bellows 3 expands and contracts with movement of the sliding direction of the table 1, the state where conveyance tunnel 7 inside was intercepted with the open air is held.

[0014]The table 1 of the wafer 5 has usually fallen in the opening 6 of the tunnel septum 8. When delivering the wafer 5 to process unit B from process unit A, the table 1 in which the wafer 5 is laid goes up in predetermined height, and the robot 11 of process unit A lays the wafer 5 on the table 1 by the finger 13 first. Then, the finger 14 of the robot 12 of process unit B takes up the wafer 5 from the table 1, and transports it into process unit B. When the elevator 4 moves caudad in the postposing stand 1, the table 1 falls in the opening 6 of the tunnel septum 8.

[0015]By drawing the finger 13 of the robot 11 in process unit A, and drawing the finger 14 of the robot 12 in process unit B, When it will be in the state where anything does not have a projection and a carrying truck stops or passes into this portion, since the wafer table 1 has fallen in the tunnel septum 8 lower part, the inside of the conveyance tunnel 7 does not produce the problem of barring passing of the carrying truck 9. when the carrying truck 9 stops in the position between process unit A and B, as shown in the Prior art, the carrying truck 9 or its wafer 5 conversely carried in the carrying truck 9 can be transported for the wafer 5 to the processing units A and B from process unit A or B.

[0016]Drawing 4 is a perspective view showing the structure of the carrying truck of the 1st example. The carrying truck 9 is equipped with the opening 10 penetrated to a sliding direction, and the table 1 which does not illustrate the inside of this opening 10 is movable to a sliding direction. The wafer 5 is supported by the pin 21 formed in the upper surface of the carrying truck 9, and is laid on the carrying truck 9. Although it is for the wheel 22 running a transportation direction the carrying truck 9, the magnetic devitation system conveying machine make carry out magnetic levitation of the carrying truck 9, and it is made to run by contact-ed from the septum 8 may be used, and the wheel 22 becomes unnecessary in this case. It is made for a linear motor type track to run in the state where it was made to rise to surface from the tunnel outside with the magnetic attraction power of the electromagnet for surfacing which equipped the carrying truck with the target of the magnetic material and with which the tunnel septum (can) exterior was equipped.

[0017]Drawing 5 thru/or drawing 7 show the conveyance tunnel in the tunnel conveying machine of the 2nd example of this invention, and the border area between process unit A and B. In this example, process unit A and process unit B differ so that the height of the conveyance face of a wafer may illustrate. Vertical movement shall be impossible for the robot 12 of process unit B,

and the finger 14 of the robot 12 shall not fall to the wafer height on the carrying truck 9. Also in this example, like the 1st above-mentioned example, the table 1 can carry out vertical movement, where the open air is intercepted with the elevator 4 and the bellows 3. In the carrying truck 9, it has the opening 10 of the shape which can pass through the table 1 into the portion corresponding to the undersurface of the wafer 5 placed on the carrying truck as shown in drawing 4.

[0018]Next, operation of this example is explained. In the state of the beginning, the table 1 has fallen downward and is located in the opening 6 of the tunnel septum 8. In order for the carrying truck 9 to carry the wafer 5 and to transport the wafer 5 to process unit B in this state, it stops to a predetermined stop position. As shown in drawing 5, the table 1 goes up from the opening 6 of the tunnel septum 8, and the wafer 5 is lifted through the inside of the opening 10 of the carrying truck 9 to the position shown in drawing 6. Next, as shown in drawing 6, the finger 14 of the robot 12 of process unit B extends, and it enters under the wafer 5. Next, as shown in drawing 6, lower the table 1, the finger 14 of the robot 12 is made to support the wafer 5, and the robot 12 of process unit B transports the wafer 5 into process unit B. The table 1 falls to the opening 6 of the septum 8, and the transportation vehicle 9 runs in the tunnel 7 to the next stop predetermined position.

[0019]The shape of the carrying truck 9 can consider various things as shown in drawing 8 thru/or drawing 9 other than the 1st example shown in drawing 4. In the carrying truck 9 of the 2nd example shown in drawing 8, it has the top plate 23 on the table 1 in which the wafer 5 is laid. Thereby, adhesion of the dust to the surface of the wafer 5 which is carried one, etc. is prevented.

[0020]Drawing 9 shows the shape of the carrying truck of the 3rd example. When the table 1 is carrying out the opening to the transportation direction like this example, In the carrying truck 9, the table 1 can run to the next destination in the stage which lifted the wafer 5 from the carrying truck 9, and it becomes possible for it to become unnecessary to stop to a spot place, and to raise the speed of a transfer of a wafer until the process of transfer of the wafer 5 is completed.

[0021]Drawing 10 thru/or drawing 11 show the border area between process unit A in the tunnel conveying machine of the 3rd example of this invention, and B. In this example, it has the opening 26 on the upper surface of the tunnel septum 8, and the table 1 is movable to a sliding direction via this opening 26. The structure where the table 1 is connected to the elevator 4 by the base material 2, the elevator 4 moves the table 1 to a sliding direction, and the open air is intercepted by the bellows 3 is the same as that of the 1st and 2nd above-mentioned example. Drawing 11 is a perspective view showing the shape of the table 1 which can be put on this example. The pin 21 which supports the wafer 5 is arranged in the table 1. The finger 13 of the robot 11 conveys the wafer 5 from the transverse direction of the table 1, and lays it on the pin 21.

[0022]The table 1 is used for transporting the wafer 5 to between process unit A and the process unit B chiefly in this example. The wafer 5 can be delivered to the table 1 by laying the wafer 5 in the finger 13 from process unit A, and lengthening the finger 13 of the robot 11 as an example of operation. The wafer 5 laid in the table 1 is inserted in the finger 14 of the robot 12 of process unit B by the wafer undersurface, and the wafer 5 is received and passed in process unit B by receiving the wafer 1 and pulling back the finger 14 in the process B.

[0023]The atmosphere in a conveyance tunnel is advanced clean atmospheres, such as a vacuum. The meaning of this invention is not limited to the above-mentioned example, and it is not necessary to say that various modification is possible. The numerals same in the inside of each figure show a same or considerable portion.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The explanatory view showing the relation of arrangement of the tunnel conveying machine and process unit of each example of this invention.

[Drawing 2]It is the section lineblock diagram which met AA line in drawing 1 of the tunnel conveying machine of the 1st example of this invention, and the state where a wafer is transported via a table is shown.

[Drawing 3]The state where a wafer is transported is shown in a process unit from the carrying truck in drawing 2.

[Drawing 4]The perspective view showing the shape of the carrying truck of the 1st example.

[Drawing 5]The section lineblock diagram which met AA line in drawing 1 of the tunnel conveying machine of the 2nd example of this invention.

[Drawing 6]The state where the wafer in drawing 5 was lifted by the table is shown.

[Drawing 7]The state where a wafer is transported to process unit B in drawing 7 is shown.

[Drawing 8]The perspective view and cross-sectional view showing the shape of the carrying truck of the 2nd example.

[Drawing 9]The perspective view and cross-sectional view showing the shape of the carrying truck of the 3rd example.

[Drawing 10]The section lineblock diagram which met AA line in drawing 1 of the tunnel conveying machine of the 3rd example of this invention.

[Drawing 11]The perspective view showing the shape of the wafer table in the tunnel conveying machine of the 3rd example.

[Drawing 12]The explanatory view showing the relation of arrangement of a conventional tunnel conveying machine and process unit.

[Drawing 13]The section lineblock diagram which met AA line in drawing 1 of the conventional tunnel conveying machine.

[Drawing 14]The state of transporting a wafer by a robot finger directly between the process units of the both sides in drawing 13 is shown.

[Drawing 15]The plan showing the relation of the robot finger and wafer in drawing 14.

[Drawing 16]The explanatory view showing the state where the middle robot chamber has been arranged between a process unit and a tunnel conveying machine, in drawing 12.

[Drawing 17]The section lineblock diagram of BB line of drawing 16 at the time of providing a middle robot chamber between a process unit and a tunnel conveying machine.

[Description of Notations]

- 1 Table
- 2 Base material
- 3 Bellows
- 4 Elevator
- 5 Wafer
- 6 The opening of a tunnel septum
- 7 Conveyance tunnel
- 8 Tunnel septum

9 Carrying truck
10 Opening
11 and 12 Robot
13 and 14 Robot finger

[Translation done.]

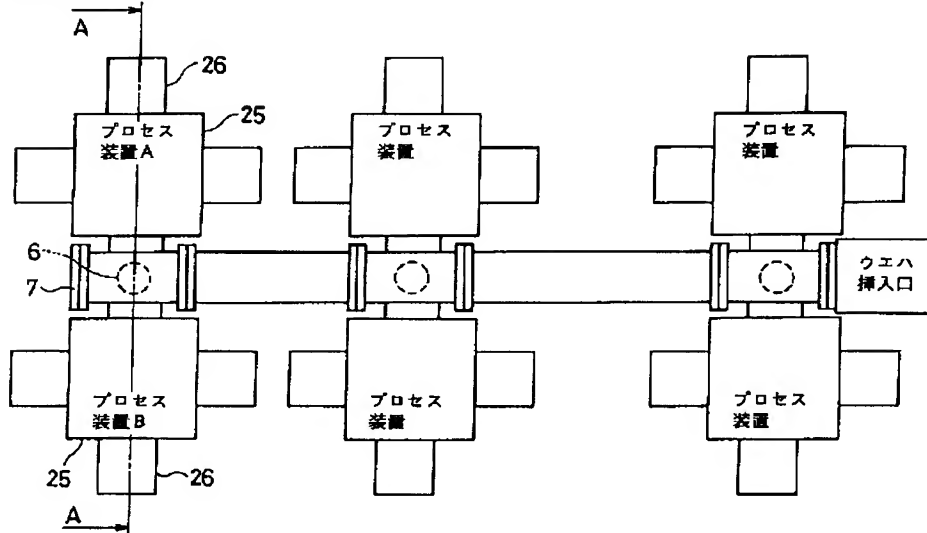
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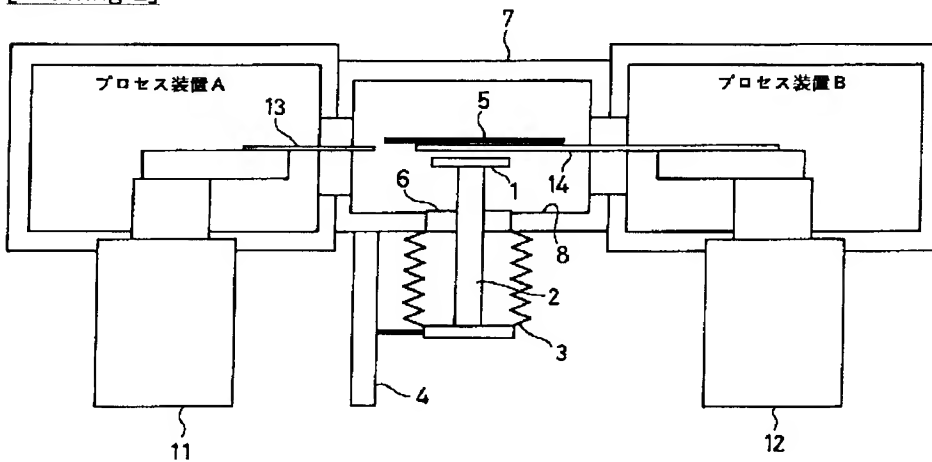
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DRAWINGS

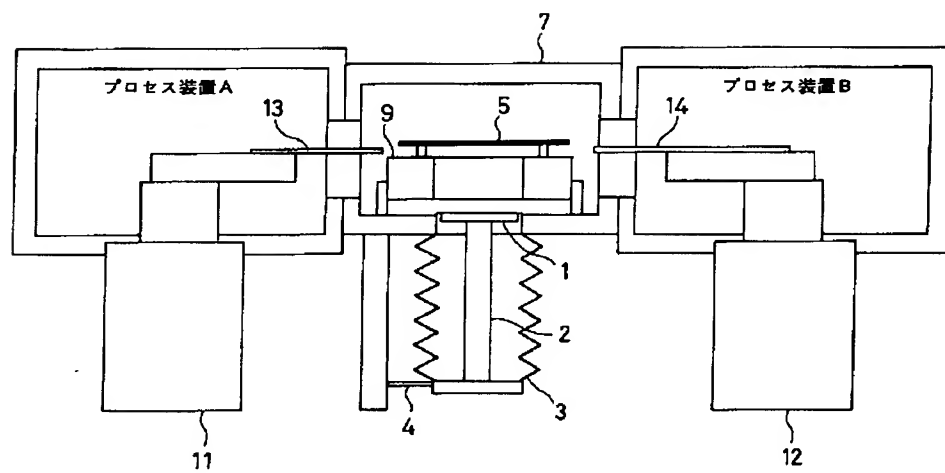
[Drawing 1]



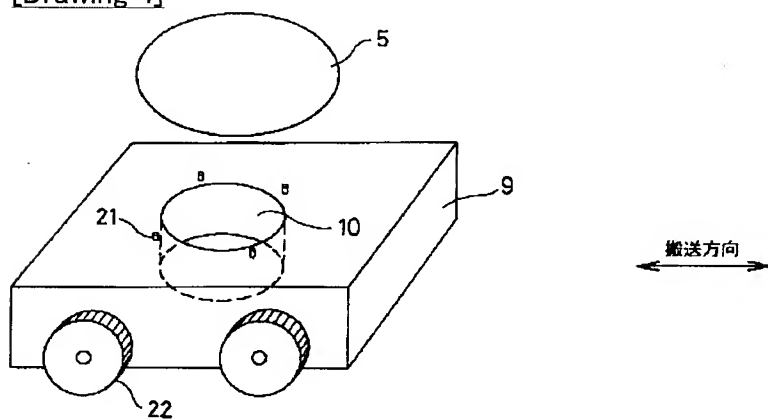
[Drawing 2]



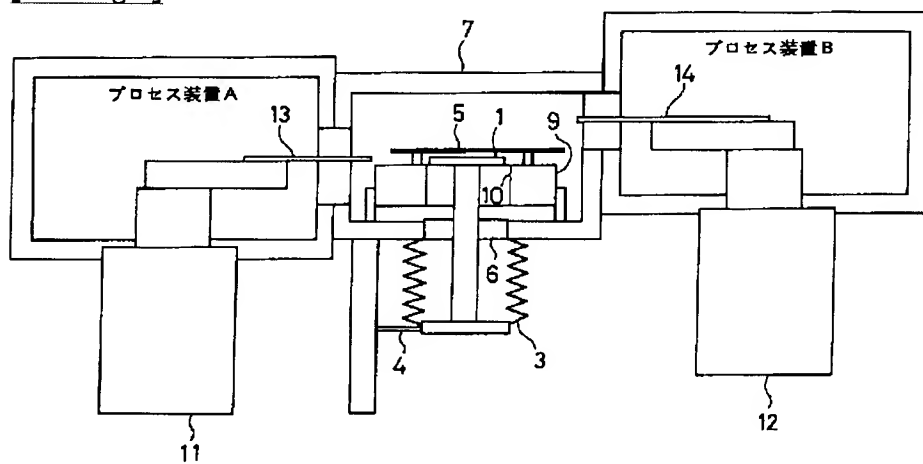
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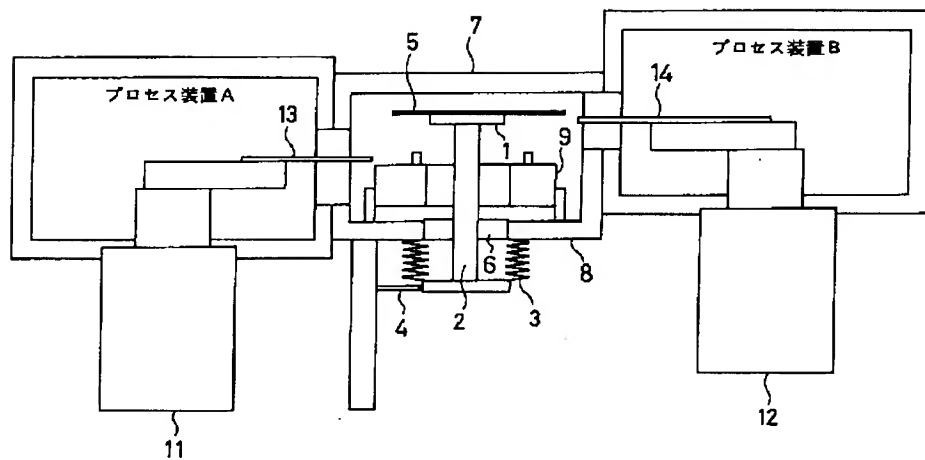
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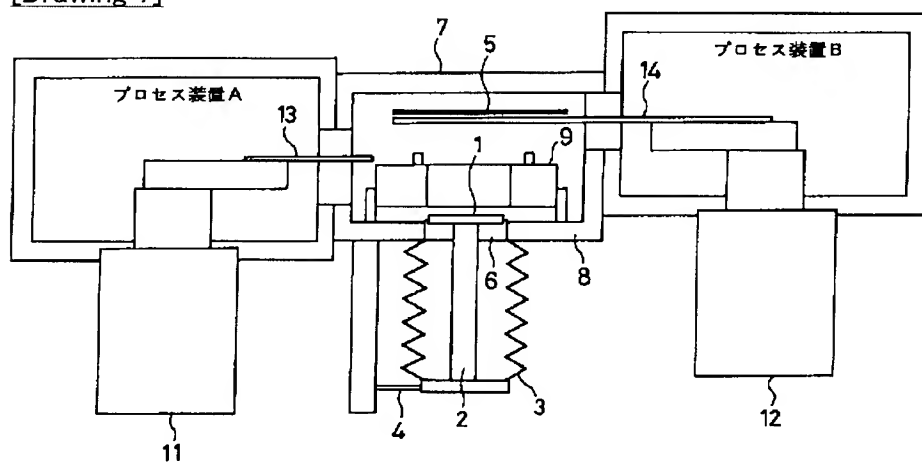
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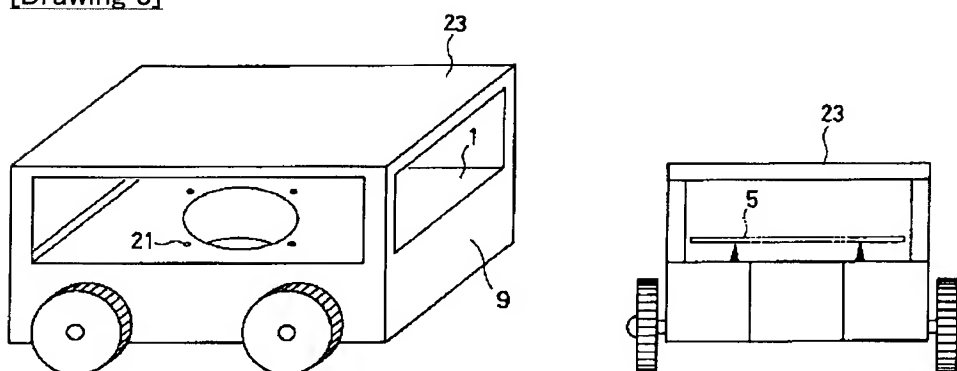
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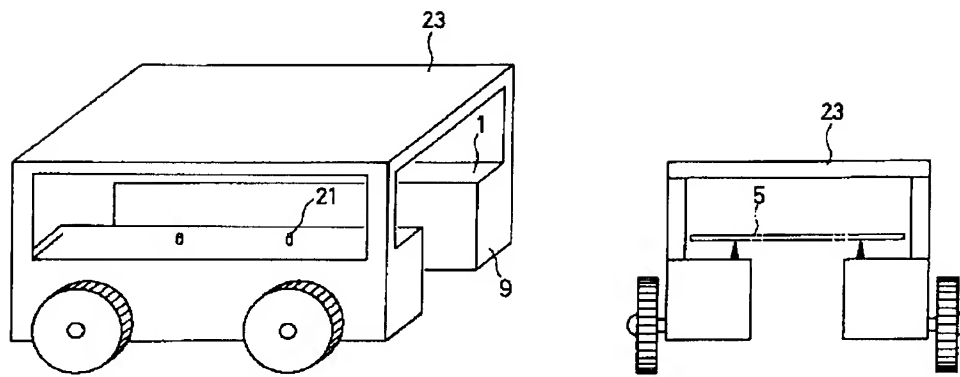
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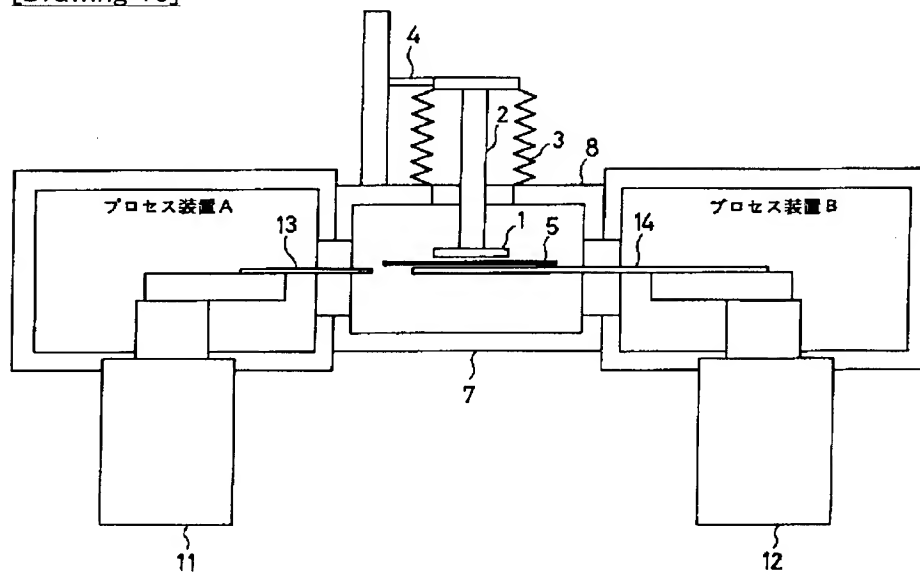
[Drawing 8]



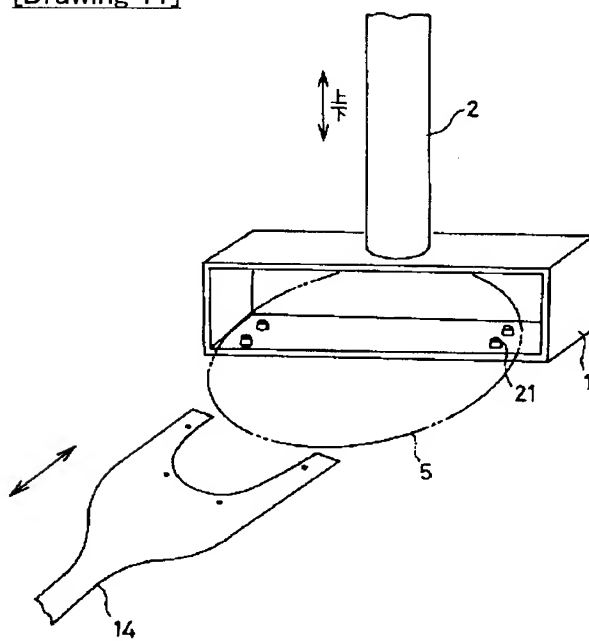
[Drawing 9]



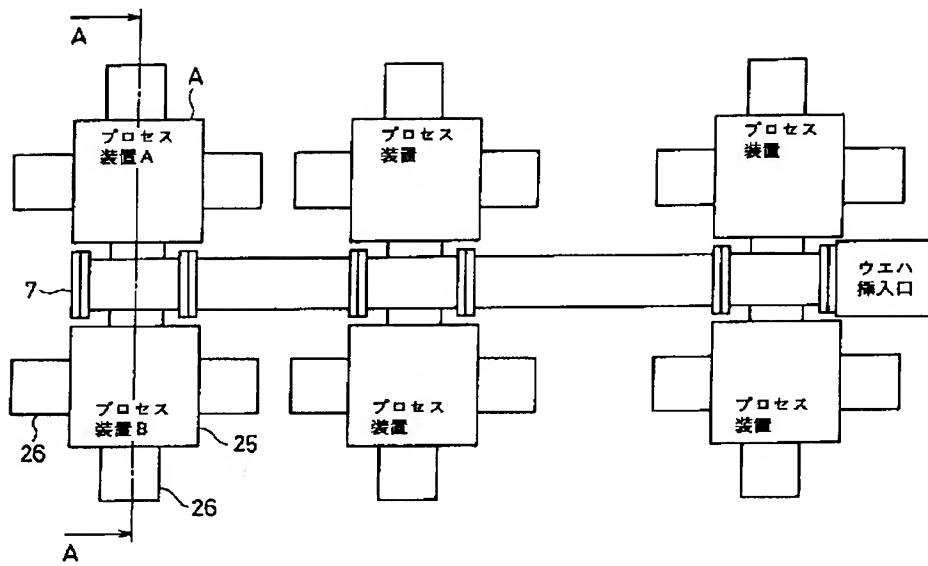
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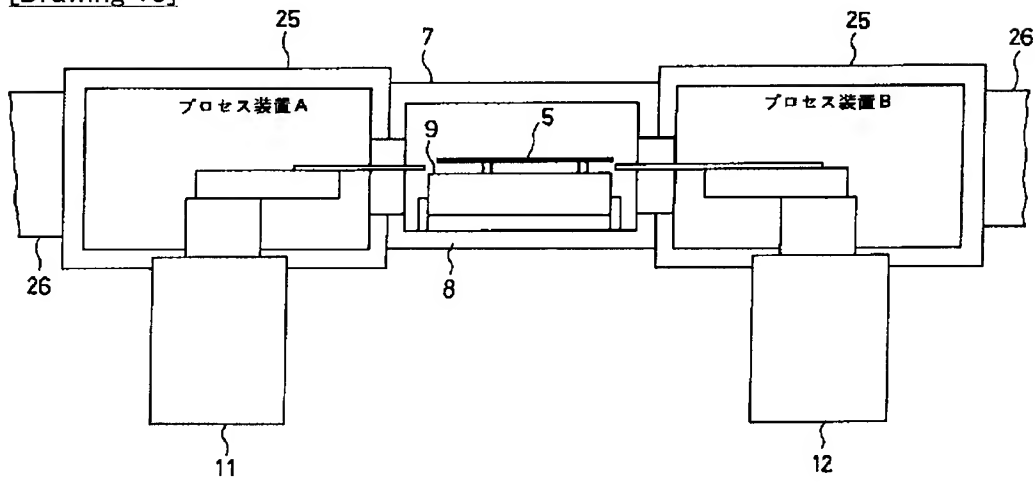
[Drawing 11]



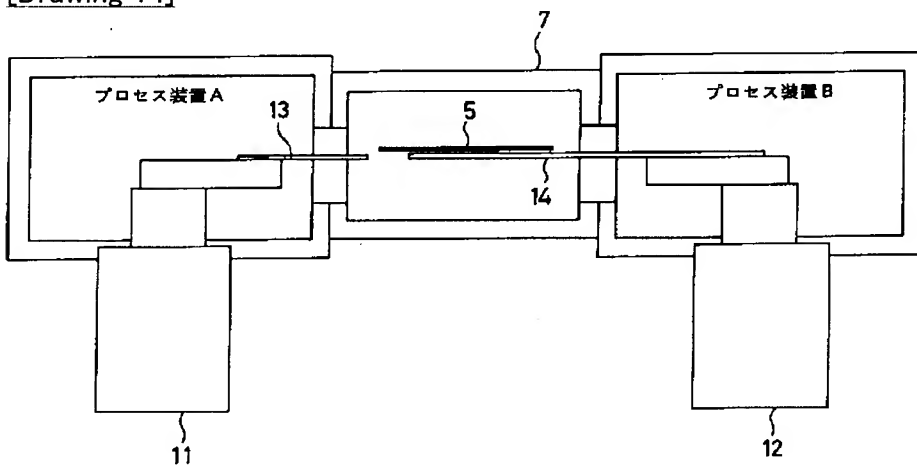
[Drawing 12]



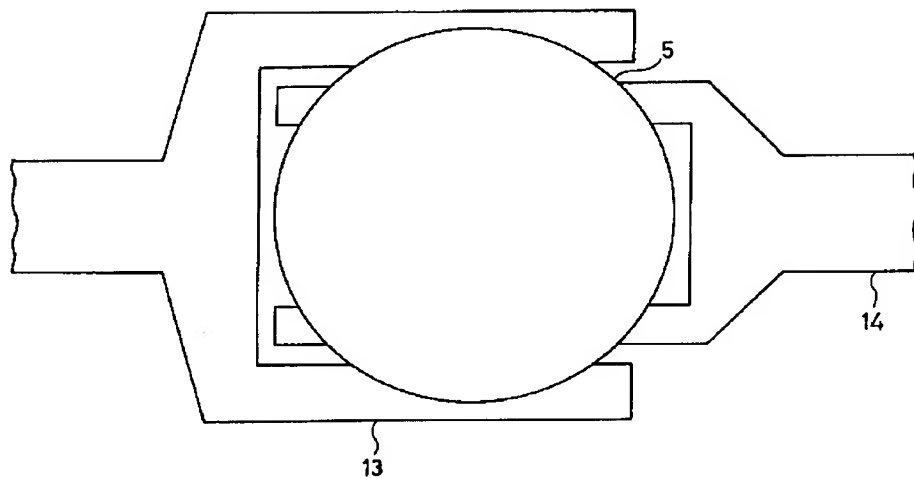
[Drawing 13]



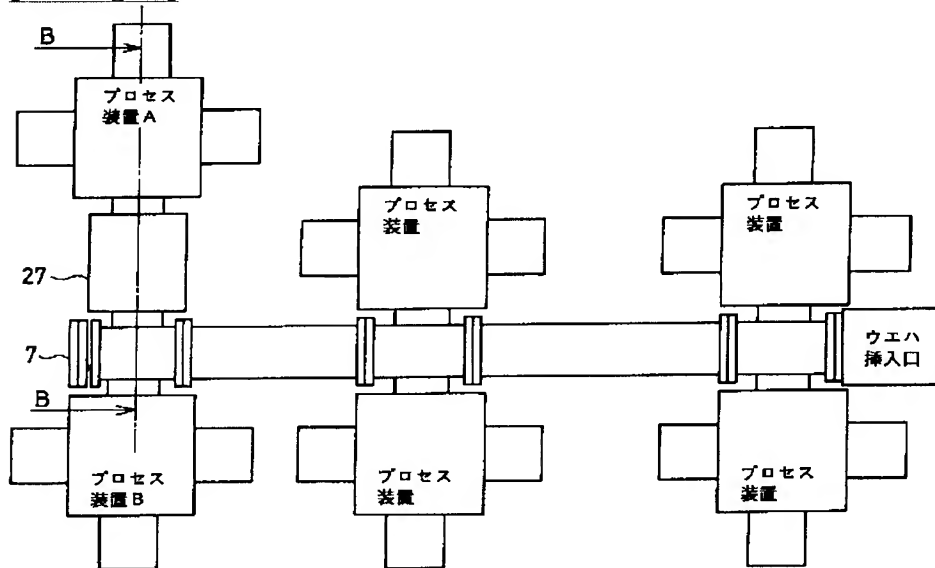
[Drawing 14]



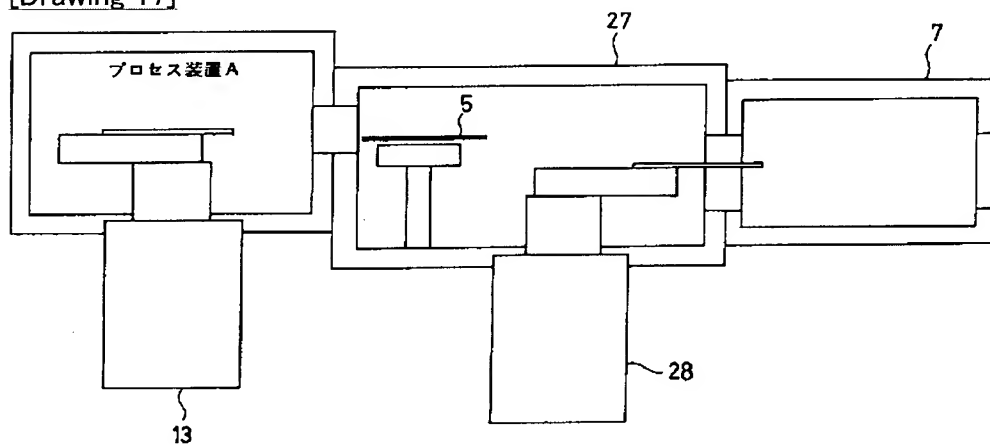
[Drawing 15]



[Drawing 16]



[Drawing 17]



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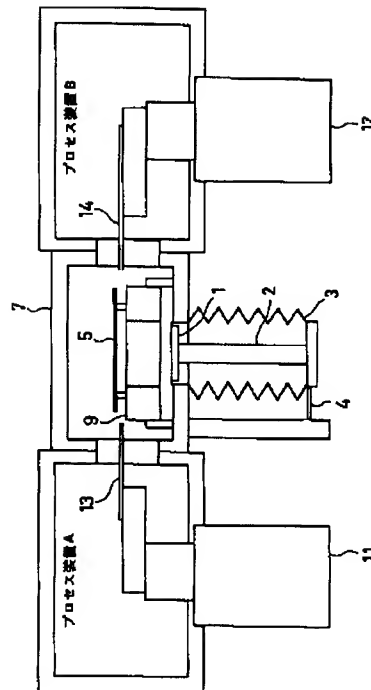
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(54) 【発明の名称】 搬送装置

(57) 【要約】

【目的】 プロセス装置とトンネル搬送装置との境界領域においてスムーズにウエハ等の被搬送物を移送することのできるトンネル搬送装置を提供する。

【構成】 トンネル7内部に被搬送物を搭載する搬送台車9を備え、トンネル隔壁8により外気を遮断した状態で被搬送物を搬送するトンネル搬送装置において、前記トンネル7内部に前記被搬送物5を載置する置台1と、該置台1を上下方向に前記トンネル7内部が外気を遮断した状態のまま移動し、該置台1の移動により前記搬送台車9の通行が妨げられないようにした。



【特許請求の範囲】

【請求項1】 トンネル内部に被搬送物を搭載する搬送台車を備え、トンネル隔壁により外気を遮断した状態で被搬送物を搬送するトンネル搬送装置において、前記トンネル内部に前記被搬送物を載置する置台と、該置台を上下方向に前記トンネル内部が外気を遮断した状態のまま移動し、該置台の移動により前記搬送台車の通行が妨げられないようにしたことを特徴とする搬送装置。

【請求項2】 前記搬送台車には上下方向に貫通する開口部を備え、該開口部内を前記置台が上下方向に移動可能であることを特徴とする請求項1記載のトンネル搬送装置。

【請求項3】 前記トンネル搬送装置の両側に配置された被搬送物を移送するロボットの搬送面の高さが異なり、前記搬送台車の上下方向に貫通する開口部内を前記置台を上下させる手段により、前記搬送面の高さが異なるロボット間に被搬送物を移送する手段を備えたことを特徴とする請求項2記載のトンネル搬送装置。

【請求項4】 前記置台は、前記トンネル隔壁の下面又は上面の開口部にベローズ機構及びエレベータ機構で機密封止されると共に上下方向に移動可能に支持されたものであることを特徴とする請求項1乃至3記載のトンネル搬送装置。

【請求項5】 前記トンネル搬送装置は磁気浮上搬送装置であることを特徴とする請求項1乃至4記載のトンネル搬送装置。

【請求項6】 前記磁気浮上搬送装置は、前記搬送台車には磁性材料のターゲットを備え、前記トンネル外部に備えられた浮上用電磁石の磁気吸引力によりトンネル外部から浮上させた状態で前記搬送台車を走行させるものであることを特徴とする請求項5記載のトンネル搬送装置。

【請求項7】 前記磁気浮上搬送装置はキャン化されており、前記搬送台車の磁気浮上制御及び走行停止制御は該キャンを通して前記トンネル外部から為されることを特徴とする請求項6記載のトンネル搬送装置。

【請求項8】 前記トンネル内部の雰囲気は真空であり、トンネル外部の雰囲気は大気であることを特徴とする請求項1乃至7記載のトンネル搬送装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は搬送装置に係り、特に半導体の製造等に好適な、トンネル内部に被搬送物を搭載する搬送台車を備え、トンネル隔壁により外気を遮断した状態で被搬送物を搬送するトンネル搬送装置に関する。

【0002】

【従来技術】 最近、半導体製造等に関して極めて高度の清浄度が要求され、粒子汚染を防ぐため、あるいは酸化等の分子汚染を防ぐために、ウエハ等の被処理物を外

気に曝すことなく、例えば真空雰囲気下でプロセス装置間を搬送する必要が出てきている。その一つの方法として、真空トンネル搬送装置で複数のプロセス装置を結び、真空トンネル内をウエハを搬送台車に搭載して搬送する試みがある。図12は、複数のプロセス装置をトンネル搬送装置で結合した半導体製造ラインの例を示している。

【0003】 図13は、図12に示すAA線に沿った断面図である。搬送トンネル7の両側にプロセス装置A、Bが相対向して配置されている。プロセス装置A、Bはそれぞれロボットチャンバ25に移載ロボット11、12を持っており、トンネル搬送装置7内を走行する搬送台車9からウエハ5をプロセス装置A、Bのプロセスチャンバ26へ移送したり、逆にプロセス装置A、Bで処理終了したウエハを、プロセス装置A、Bから取り出し搬送台車9に移送し、搬送台車9がトンネル搬送路7内を走行し次の処理装置へ搬送する。

【0004】 この搬送台車9は、トンネル隔壁8外部に取り付けられた図示しないリニアモータと停止位置決め装置等によって、トンネル7内を移動し被搬送物5を搬送し所定の位置に停止する。

【0005】 また、トンネル搬送装置については、トンネル内部で搬送台車がトンネル隔壁と接触することなく、搬送台車を走行させることができる磁気浮上搬送装置が開発されており、係る搬送装置によればトンネル内部で粒子を発生させることなく極めて清浄な環境下でウエハ等の被搬送物を処理装置間に搬送することができる。係る磁気浮上搬送装置の一例が、本発明者等により国際特許出願PCT/J P 93/00930に詳細に開示されている。この装置は、磁極センサ、電磁石等ガス発生のおそれがある部材がトンネル隔壁の大気側に配置され、薄い隔壁を介して外気と遮断されたトンネル内部にある搬送台車を浮上させ、同様にトンネル隔壁外部に配置されたリニアモータ等により搬送台車を走行あるいは停止させる。また係る磁気浮上搬送装置によれば、直交した分岐を有するトンネル内を搬送台車は直交方向に分岐し走行することも可能である。

【0006】

【発明が解決しようとする課題】 しかしながら、このようなプロセス装置とトンネル搬送装置との境界領域においては、ウエハ5をプロセス装置Aからプロセス装置Bに移送するというような相対向するプロセス装置間の移送の場合には、プロセス装置Aのロボット11はウエハ5をいったん搬送台車9上に置き、次にプロセス装置Bのロボット12が搬送台車9上のウエハ5を取り上げプロセス装置B内へ移送するという動作が行われる。すなわち、相対向したプロセス装置A、B間では、ウエハ5を受け渡すときには、搬送台車9はウエハ5を搬送する必要がないにもかかわらず、ウエハ5を受け渡す一時的な置台としてプロセス装置A、B間に位置していなけ

3

ればならない。搬送台車9がたまたまトンネル7内の他の位置に移動している場合にはウエハ5の受け渡しをすることができず、搬送台車9がプロセス装置A、B間に戻るまでの時間にはウエハの移送ができず、ウエハの受け渡しをするための時間がかかるという問題があった。

【0007】また、図14に示すようにプロセス装置A、B間のロボット11、12で直接ウエハ5を受け渡すことも考えられる。しかしながら、このような場合には図15に示すように、ロボットのフィンガ13、14の形状が互いに干渉しない形状になっていなくてはならない。ところが、ロボットフィンガ13、14の形状はプロセス装置内のウエハ置台の形状等によりすでに決定されており、変更はなかなか難しく、ロボットフィンガ13、14間で干渉しないようにするのは容易でない。このため、処理装置A、B間でロボット11、12のフィンガ13、14により直接ウエハ5を移送することは通常用いることができない。

【0008】さらに、プロセス装置A、Bと搬送トンネル7間の境界領域の問題点として、接続されるプロセス装置A、Bのウエハ搬送面の高さがある。一般のプロセス装置のウエハ搬送面は装置ごとに異なっており種々の高さがある。これらを共通のトンネル搬送装置に接続しようとする、移載ロボット11、12によっては、その上下動の範囲が限られており、搬送台車からウエハを授受することが困難な場合がある。

【0009】また、プロセス装置A、Bによっては装置内部のウエハ置台が上下動しロボット11、12自体は上下動できないものもある。このような場合には、図16に示すようにプロセス装置A、Bと搬送トンネルとの間に中間ロボットチャンバ27を挿入し、このチャンバ27内のロボット28を経由してウエハの授受を行うことによりウエハ搬送面高さの調整を行っている。このため、ウエハの搬送装置が大型化してしまい高価になるという問題点がある。

【0010】本発明に係る従来技術の問題点を鑑みて為されたものであり、プロセス装置とトンネル搬送装置との境界領域においてスムーズにウエハ等の被搬送物を移送することのできるトンネル搬送装置を提供することを目的とする。

【0011】

【課題を解決するための手段】本発明のトンネル搬送装置は、トンネル内部に被搬送物を搭載する搬送台車を備え、トンネル隔壁により外気を遮断した状態で被搬送物を搬送するトンネル搬送装置において、前記トンネル内部に前記被搬送物を載置する置台と、該置台を上下方向に前記トンネル内部が外気を遮断した状態のまま移動し、該置台の移動により前記搬送台車の通行が妨げられないようにしたことを特徴とする。

【0012】

【作用】プロセス装置A、B間のトンネル内の搬送台車

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停止位置に、被搬送物を載置する置台と、該置台を上下方向にトンネル内部が外気を遮断した状態で移動する手段とを備えたことから、ウエハの置台を経由してトンネルに対して相対するプロセス装置のロボット間でウエハの受け渡しが可能となる。更に、搬送台車にも、上下方向に貫通する開口を備え、搬送台車が停止しているときに搬送台車上に載置されたウエハを下からエレベータ機構により置台が押し上げ、任意の位置に上昇した置台上のウエハをプロセス装置のロボットフィンガが受け取りにいく構造としたものである。従って、移載ロボットの高さの制限がなくなり、各種のウエハ搬送高さ、また移載ロボットがそのフィンガを上下動できない場合にも、中間移載ロボットを使用することなしに、プロセス装置を共通の搬送トンネルに接続しウエハの受け渡しをスムーズに行うことができるようになる。

【0013】

【実施例】以下に、本発明の第1乃至第3実施例を添付図面を参照しながら詳細に説明する。図1乃至図2は本発明の第1実施例のトンネル搬送装置を示し、図1はプロセス装置とトンネル搬送装置との配置を示し、図2は図1におけるAA線に沿ったトンネル搬送装置とプロセス装置間の断面構成を示す。図1に示すように、搬送トンネル7を経由してウエハを移送する可能性のある場所、すなわちプロセス装置間の搬送台車9の停止点には搬送トンネル隔壁8下部に開口部6を設け、該開口部6にウエハ5を載置する置台1が配置されている。置台1は、支持体2がエレベータ4に接続されていることから、上下方向に移動可能である。また、置台1の上下方向の移動に伴いベローズ3が伸縮することから、搬送トンネル7内部は外気と遮断された状態が保持される。

【0014】ウエハ5の置台1は、通常はトンネル隔壁8の開口部6に下がっている。プロセス装置Aからプロセス装置Bへウエハ5を受け渡すときには、ウエハ5を載置する置台1が所定の高さに上昇し、まずプロセス装置Aのロボット11がそのフィンガ13によりウエハ5を置台1の上に載置する。その後、プロセス装置Bのロボット12のフィンガ14がウエハ5を置台1から取り上げ、プロセス装置B内へ移送する。その後置台1はエレベータ4が下方に移動することにより置台1はトンネル隔壁8の開口部6に下がる。

【0015】ロボット11のフィンガ13がプロセス装置A内に引き込まれ、ロボット12のフィンガ14がプロセス装置B内に引き込まれることにより、搬送トンネル7内は突起物が何もない状態となり、搬送台車がこの部分に停止あるいは通過する場合は、ウエハ置台1がトンネル隔壁8下部に下がっているので搬送台車9の通行を妨げるという問題を生じない。搬送台車9がプロセス装置A、B間の位置に停止した場合には、従来の技術に示したようにウエハ5をプロセス装置AあるいはBから搬送台車9に、あるいはその逆に搬送台車9に搭載され

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たウエハ5を処理装置A、Bへ移送することができる。

【0016】図4は、第1実施例の搬送台車の構造を示す斜視図である。搬送台車9には上下方向に貫通する開口部10を備え、該開口部10内を図示しない置台1が上下方向に移動可能になっている。ウエハ5は搬送台車9の上面に設けられたピン21によって支持され搬送台車9上に載置される。車輪22は搬送台車9を搬送方向に走行させるためのものであるが、搬送台車9を磁気浮上させ隔壁8から被接触で走行させる磁気浮上式搬送装置を用いてもよく、この場合においては車輪22は不要となる。尚、磁気浮上搬送装置は、搬送台車には磁性材料のターゲットを備え、トンネル隔壁（キャン）外部に備えられた浮上用電磁石の磁気吸引力によりトンネル外部から浮上させた状態で走行させるものである。

【0017】図5乃至図7は本発明の第2実施例のトンネル搬送装置における搬送トンネルとプロセス装置A、B間の境界領域を示す。本実施例では、プロセス装置Aとプロセス装置Bとはウエハの搬送面の高さが図示するように異なっている。またプロセス装置Bのロボット12は上下移動が不可能であり、ロボット12のフィンガ14は搬送台車9上のウエハ高さまで下がることのできないものとする。本実施例においても前述の第1実施例と同様に置台1はエレベータ4及びベローズ3によって外気を遮断した状態で上下移動することが可能である。また、搬送台車9には図4に示すように搬送台車9上に置かれたウエハ5の下面に対応する部分に、置台1が通過できる形状の開口部10を有している。

【0018】次に本実施例の動作について説明する。最初の状態では置台1は下に下がっており、トンネル隔壁8の開口部6に位置している。この状態で、搬送台車9がウエハ5を搭載してウエハ5をプロセス装置Bに移送するために所定の停止位置に停止する。図5に示すように、トンネル隔壁8の開口部6から置台1が上昇し、搬送台車9の開口部10内を通過してウエハ5を図6に示す位置まで持ち上げる。次に、図6に示すようにプロセス装置Bのロボット12のフィンガ14が延びてウエハ5の下に入る。次に図6に示すように、置台1を下げ、ウエハ5をロボット12のフィンガ14に支持させ、プロセス装置Bのロボット12がウエハ5をプロセス装置B内へ移送する。置台1は隔壁8の開口部6まで下がり、搬送車9はトンネル7内を次の停止予定位置に走行する。

【0019】なお、搬送台車9の形状は図4に示す第1実施例の他に図8乃至図9に示すような種々のものが考えられる。図8に示す第2実施例の搬送台車9では、ウエハ5が載置される置台1の上に天板23を備えている。これにより、被搬送物であるウエハ5の表面への塵埃等の付着が防止される。

【0020】図9は、第3実施例の搬送台車の形状を示す。本実施例のように置台1が搬送方向に対して開口し

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ている場合には、置台1がウエハ5を搬送台車9から持ち上げた段階で搬送台車9は次の目的地へ走行でき、ウエハ5の授受の工程が終了するまでその場所へ止まる必要がなくなり、ウエハの移送の速度を向上させることが可能となる。

【0021】図10乃至図11は、本発明の第3実施例のトンネル搬送装置におけるプロセス装置A、B間の境界領域を示す。本実施例においては、トンネル隔壁8の上面に開口26を有し、置台1は該開口26を介して上下方向に移動可能となっている。置台1が、支持体2によりエレベータ4に接続され、エレベータ4が置台1を上下方向に移動させ、ベローズ3により外気が遮断されている構造は前述の第1、第2の実施例と同様である。図11は、本実施例に置ける置台1の形状を示す斜視図である。置台1にはウエハ5を支持するピン21が配置されている。ロボット11のフィンガ13は、置台1の横方向からウエハ5を搬送しピン21上に載置する。

【0022】本実施例においては、置台1は専らプロセス装置Aとプロセス装置B間へウエハ5を移送することに用いられる。動作の一例として、プロセス装置Aからフィンガ13にウエハ5を載置しロボット11のフィンガ13を伸ばすことによりウエハ5を置台1に受け渡すことができる。置台1に載置されたウエハ5を、プロセス装置Bのロボット12のフィンガ14がウエハ下面に挿入され、ウエハ1を受取りプロセスB内にフィンガ14を引き戻すことにより、ウエハ5はプロセス装置B内に受け渡される。

【0023】尚、搬送トンネル内の雰囲気は、真空等の高度の清浄雰囲気となっている。本発明の趣旨は上記実施例に限定されるものでなく種々の変形が可能であることは言うまでもない。又、各図中同一の符号は同一又は相当部分を示す。

【0024】

【発明の効果】以上に説明したように本発明の搬送装置によれば、第1にトンネル搬送装置の両側に配置されたプロセス装置間でウエハの搬送を置台を経由することによって搬送台車を用いることなく行うことができる。また、第2にプロセス装置間のウエハの搬送高さが異なるような場合でも、置台は上下の移動機構を備えていることから容易に搬送面の高さを調整することができる。これにより、プロセス装置間でスムーズに被搬送物を移送することが可能となる。

【図面の簡単な説明】

【図1】本発明の各実施例のトンネル搬送装置とプロセス装置の配置の関係を示す説明図。

【図2】本発明の第1実施例のトンネル搬送装置の図1におけるAA線に沿った断面構成図であり、置台を介してウエハが移送される状態を示す。

【図3】図2における搬送台車からプロセス装置にウエハが移送される状態を示す。

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【図4】第1実施例の搬送台車の形状を示す斜視図。

【図5】本発明の第2実施例のトンネル搬送装置の図1におけるAA線に沿った断面構成図。

【図6】図5におけるウエハが置台により持ち上げられた状態を示す。

【図7】図7におけるプロセス装置Bにウエハが移送される状態を示す。

【図8】第2実施例の搬送台車の形状を示す斜視図及び横断面図。

【図9】第3実施例の搬送台車の形状を示す斜視図及び横断面図。 10

【図10】本発明の第3実施例のトンネル搬送装置の図1におけるAA線に沿った断面構成図。

【図11】第3実施例のトンネル搬送装置におけるウエハ置台の形状を示す斜視図。

【図12】従来のトンネル搬送装置とプロセス装置の配置の関係を示す説明図。

【図13】従来のトンネル搬送装置の図1におけるAA線に沿った断面構成図。

【図14】図13における両側のプロセス装置間に直接 20
ロボットフィンガによりウエハの移送を行う状態を示す。

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【図15】図14におけるロボットフィンガとウエハとの関係を示す上面図。

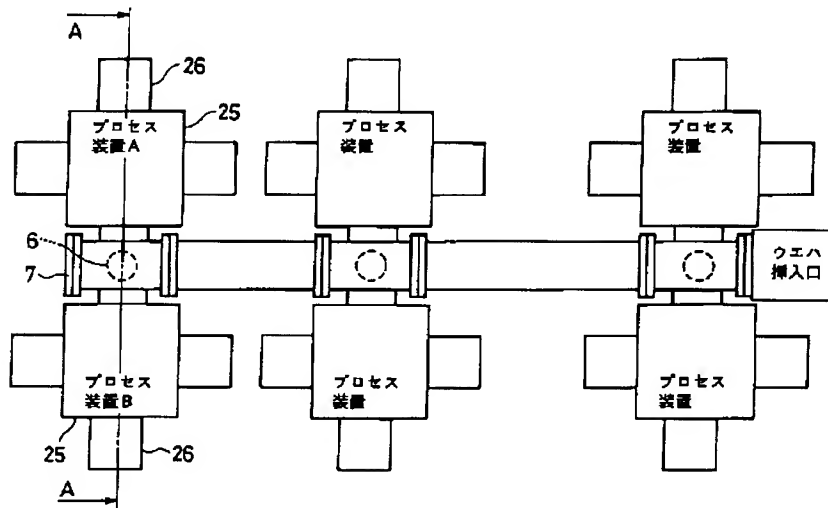
【図16】図12において、中間ロボットチャンバをプロセス装置とトンネル搬送装置間に配置した状態を示す説明図。

【図17】プロセス装置とトンネル搬送装置間に中間ロボットチャンバを設けた場合の図16のBB線の断面構成図。

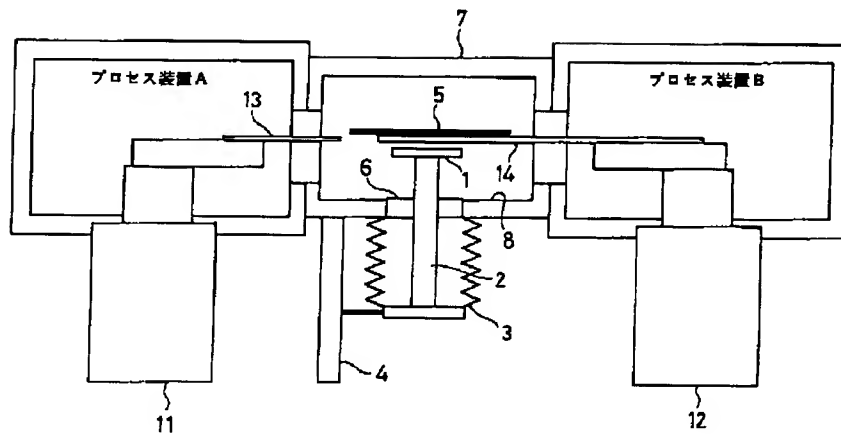
【符号の説明】

- 1 置台
- 2 支持体
- 3 ベローズ
- 4 エレベータ
- 5 ウエハ
- 6 トンネル隔壁の開口部
- 7 搬送トンネル
- 8 トンネル隔壁
- 9 搬送台車
- 10 開口部
- 11, 12 ロボット
- 13, 14 ロボットフィンガ

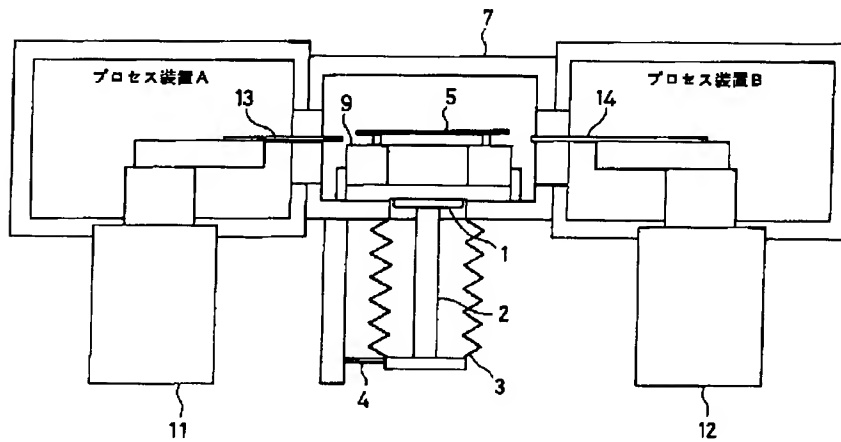
【図1】



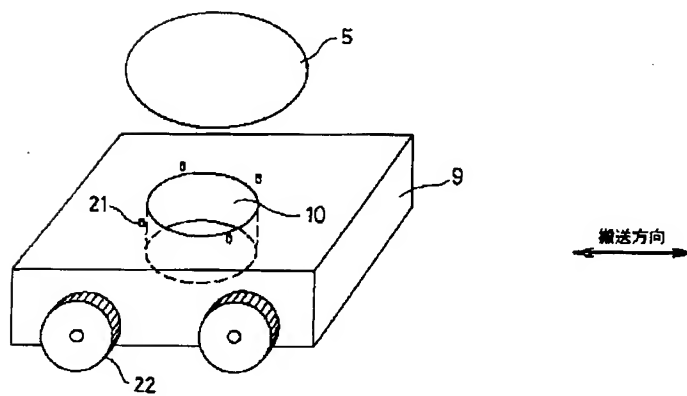
【図2】



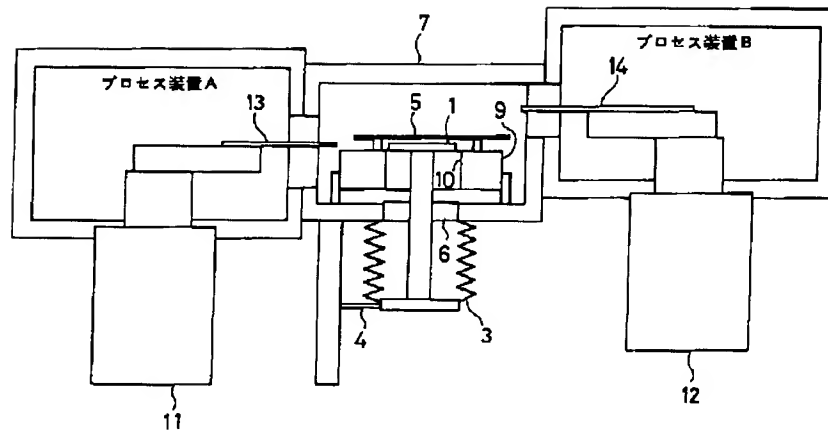
【図3】



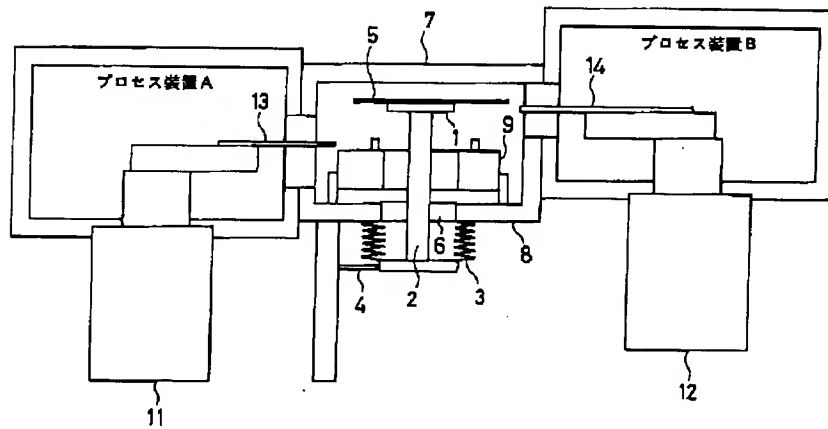
【図4】



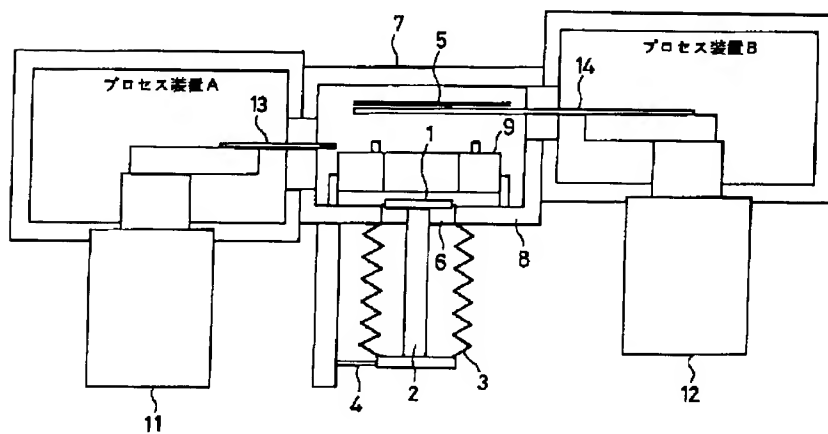
【図5】



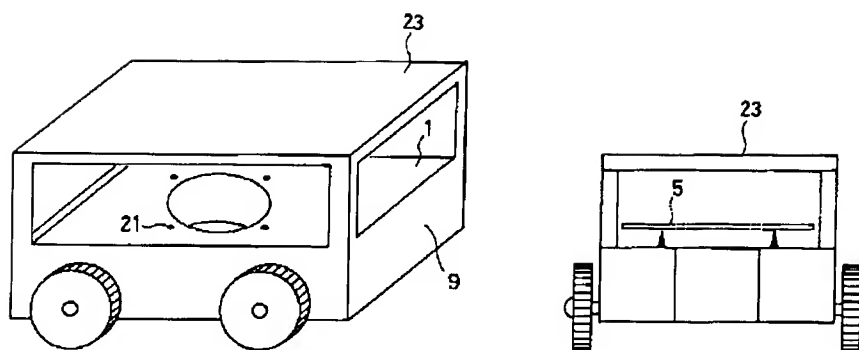
【図6】



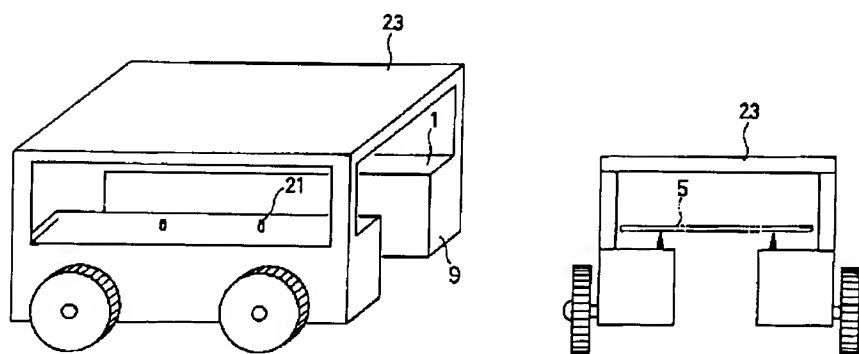
【図7】



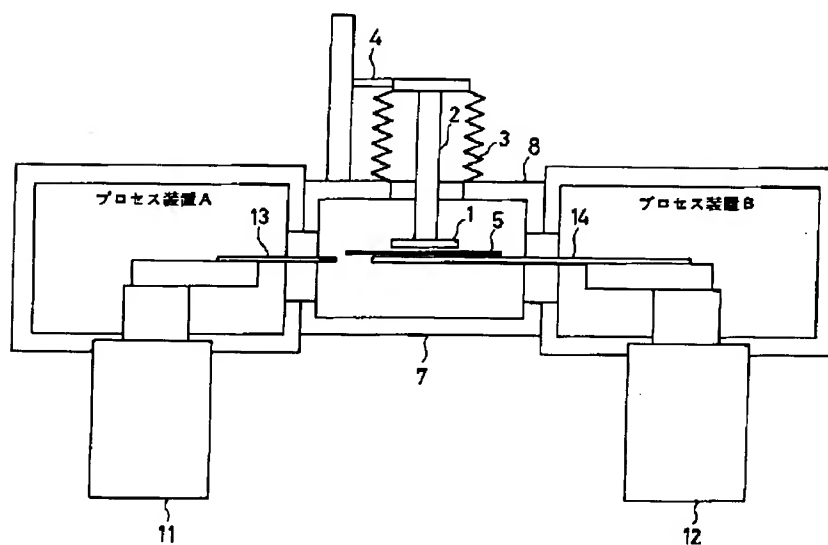
【図8】



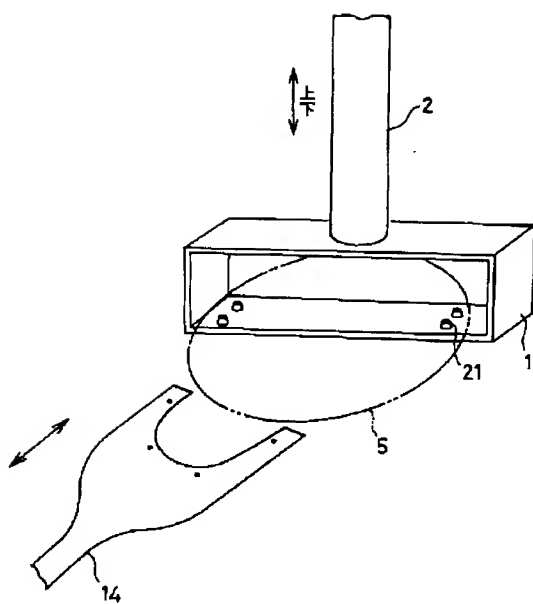
【図9】



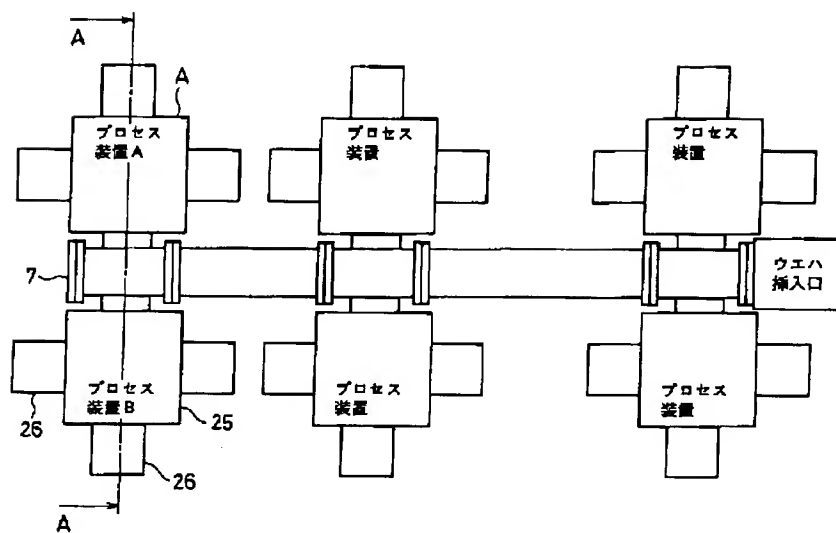
【図10】



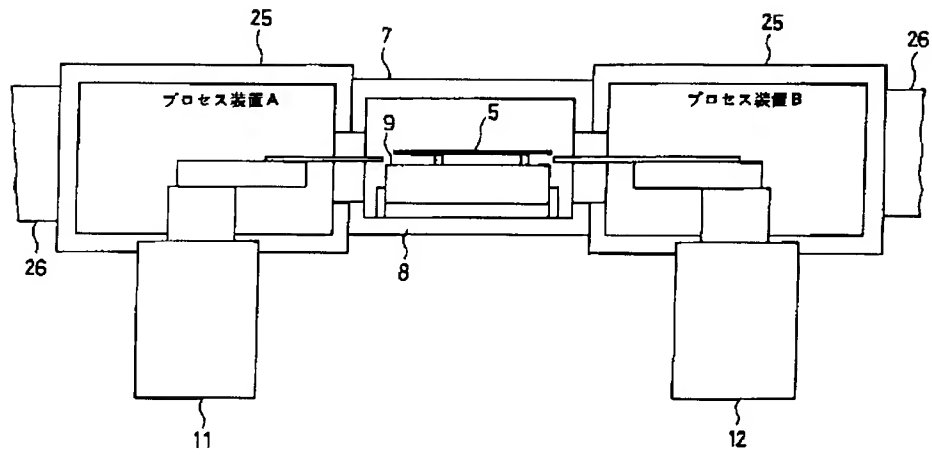
【図11】



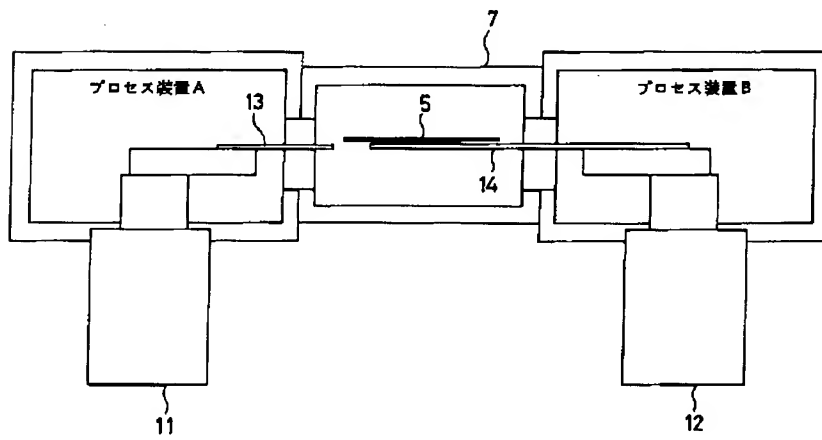
【図12】



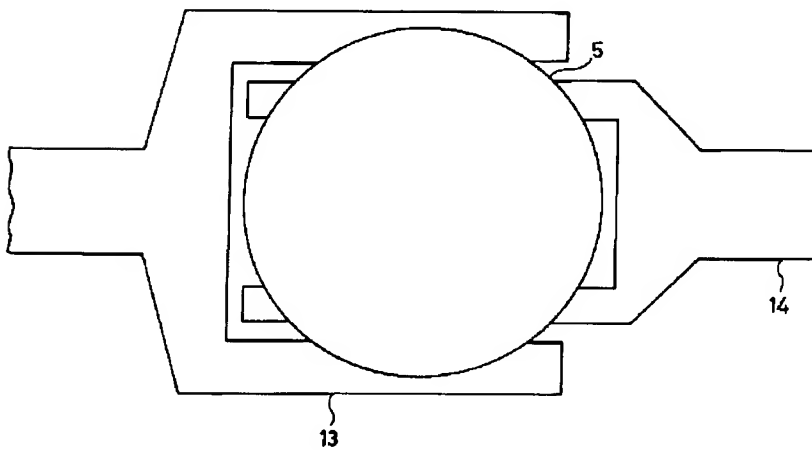
【図13】



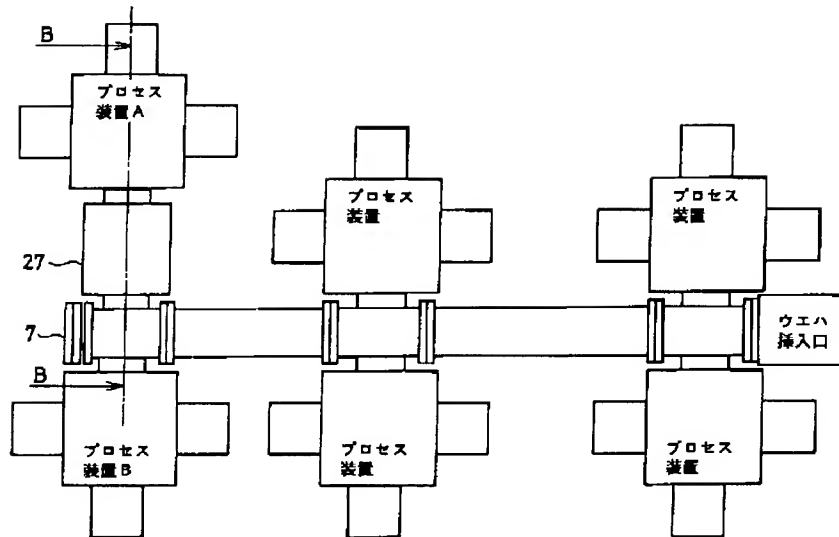
【図14】



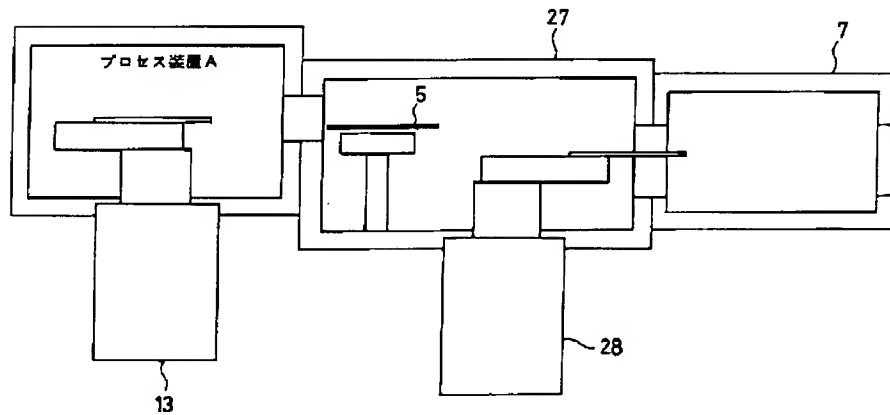
【図15】



【図16】



【図17】



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